Ed. Dept. Supt. of Public
Inst. Biennial Report

THE UNIVERSITY OF MINNESOTA.
MINNEAPOLIS, MINN., Nov. 1, 1890.

To His Excellency, Hon. W. R. Merriam, Governor of the State of Minnesota:

SIR: I have the honor to transmit herewith the sixth biennial report (No. 17 of the series), of the condition and progress of the University for the years 1888-89; and 1889-90.

Very respectfully,

Your obedient servant,

CYRUS NORTHROP,
President.

REPORT

OF THE

UNIVERSITY OF MINNESOTA.

During the years 1888-89, 1889-90, the University of Minnesota has enjoyed a greater degree of prosperity, and has made greater progress than during any previous years of its history. The wisdom and confidence displayed by the board of regents in organizing the departments of law and medicine and the school of agriculture at the close of the year 1887-88, when there were no available funds for the support of these additional departments, have been amply vindicated by the prosperity which has attended the work in all of these new departments, and by the provision made for their support by the Legislature of the State in the winter of 1888-89. The University, however, would have been painfully cramped and hindered in its work during these years but for the munificent liberality of a member of the board of Regents, Hon. John S. Pillsbury, to whom it owes not only the noblest building yet erected on the campus, but also the erection of other buildings at least a year earlier than would have been possible, if Gov. Pillsbury's advances of money had not been made much faster than it was proposed in the terms of his gift, and if it had been necessary to wait for the appropriations of the legislature to become available before beginning to build. The noble building which his liberality erected and equipped has been appropriately named by the board of regents, Pillsbury Hall, and it will stand as a lasting memorial not merely of his liberality but of his wise interest in the educational welfare of Minnesota. The full extent of his services to the University by his gift can not be measured by this one building. The chemical and physical laboratory, nobly planned and well built and furnished with adequate apparatus for the most efficient work, ready now for immediate use, would

not have been finished till the autumn of '91, but for the timely advances of money by Governor Pillsbury. As it is, most valuable time at a most important period of the University's development, has been gained, and a wide interest in the University has been awakened not only in Minnesota but in all parts of our country, an interest fully justified by the present equipment of the institution for scientific study.

NEW BUILDINGS.

During the last two years buildings have been erected as follows:

1. Pillsbury Hall, 245 feet front, built of stone, has been finished and has been in use during most of the past year. In it are the most ample accommodations for the departments of geology, mineralogy, animal biology and botany, of which a more detailed statement is given elsewhere in this report; and also accommodations for the geological survey, the school of design, the school of mines and the museums.

2. The physical and chemical laboratory, built of Roman brick with red sandstone basement, 192 feet front, is now ready for use and will furnish accommodations to the departments of physics and chemistry, of which a more detailed statement is also given elsewhere. This building covers the ground formerly occupied by the agricultural and chemical building that was badly damaged by fire in the fall of 1888, but it is very much larger and in every respect better than the building whose place it takes.

3. The law building, 80 feet front, built of pressed brick with red sandstone trimmings, was finished in 1889, and has been in use by the department during the past year. It contains a large room for library, a large lecture room, four lecture and recitation rooms of smaller size, and offices for the dean and professors.

4. The heating plant, containing the heating apparatus for the university, and large enough to contain boilers in sufficient numbers to meet the requirements of twenty years to come, was built of brick, and finished in 1889, and has been in use during the past year. At the rear of this building, and resting on a part of its foundation, is the plant house, of which a more detailed account is given under the subject of botany.

5. The school of agriculture has a new building, 60 by 70 feet in dimensions, which was erected in 1888, and has been in use during the last year. It is built of brick, is situated in a

most commanding location, and besides furnishing ample recitation and lecture-room facilities, it enables the school to provide dormitories for one hundred students.

6. Fire having broken out in the upper part of the main building during the Christmas vacation of 1889, the library was in danger and was removed as rapidly as possible to the law building. Considerable damage was done to the upper part of the building, and when the necessary repairs were made, the opportunity was embraced to improve some portions of the building that had long sadly needed attention. The assembly room or chapel in the fourth story and many of the recitation rooms were repapered. The library, however, was restored to its old quarters unimproved. In this building, also, the rooms formerly occupied by the museum have been fitted up as recitation rooms, furnishing excellent accommodations to the departments of Latin and psychology. The removal of the various scientific departments to the new buildings erected for their especial accommodation, has relieved the pressure for room in the main building, and it is believed that all departments in this building are now reasonably well accommodated, though not all in an equal degree. The main building has been so greatly improved and so many changes have been made in its rooms, that it seems proper to place its record with that of the "new buildings."

7. The veterinary hospital at the experiment station, is a comparatively small building, built of wood, and designed to meet the wants of the veterinary department so far as practical instruction in the school of agriculture is concerned. This purpose it serves well. Should the veterinary department, however, grow into a college by itself, doing for the northwest what veterinary colleges in the east, and notably in Philadelphia, do for the whole country, the present hospital will prove altogether too small for the needs of the institution. At present, however, it serves a useful purpose and meets the actual needs of the work in the school of agriculture.

THE SCHOOL OF AGRICULTURE.

The school of agriculture has been in operation two years and has been very successful. The number of students in the school the first year was fifty-seven, and the second year seventy eight. The improvement in the students has been of a marked character. Fourteen graduated in the first class, April 1, 1890. Most of these after graduation returned to their homes

to engage in farm work. The course of study is now so arranged as to fit the student for practical work in farm life, while the opportunity is also given to those who wish it, to prepare for higher studies in science. The arrangement meets the hearty approval of the most intelligent farmers and friends of agricultural education in the state. The young men who have been in the school, have, it is believed been more than satisfied with the opportunities for improvement which have been given them, and an increasing number of young men are likely to avail themselves of the privileges of the school the next year. It would be difficult to plan a course of study of the same length that would be at once more practical and more stimulating to the intellect than the present course of the school of agriculture. While the state is to be congratulated on having such a school, there appears to be no good reason why its advantages should not be extended to the girls of the state It would be very easy to provide for the comfort of the girls at the farm; the studies of interest to all they could share with the boys, just as the girls in other departments of the University pursue their studies in classes with the boys. Mathematics, botany, chemistry, zoology, entomology, horticulture and farm accounts, could thus be profitably taken by the girls as well as by the boys. They could also receive thorough instruction in cooking in all its varied operations of baking, boiling, broiling, frying, mixing and seasoning, serving, as also in all the other household duties upon the successful performance of which the happiness of home so much depends. In short they could be made accomplished housewives, capable of something far better than coarse drudgery, able to minister to the comfort of their households in health and sickness alike, making their homes neat and pleasant, and with their cultivated taste adding to the attractions of the homestead by skillful landscape gardening and the cultivation of flowers, as men rarely can. There is a real demand in the state that the girls shall be given an opportunity to thus prepare themselves for their duties in farmers' homes. More than twenty applications were received last year—and it needs but to be known that the farmers' daughters can be received at the school of agriculture and can there acquire knowledge and skill in all the practical work of housekeeping, to insure an attendance of girls in even greater numbers than the boys. The subject is one of the greatest practical importance and should receive the careful attention of the board. The girls should be received into the school at

the opening of the school in October, 1891. Fortunately the board will be able to secure for this work, the services of a lady who probably has no superior in the country in respect to qualifications for this special work. Should this plan be approved by the board, it will be found to be easy of execution, and will prove of the greatest benefit to the people of the state. It cannot wisely be put in operation the present year. It cannot wisely be postponed beyond the present year.

THE DEPARTMENT OF LAW.

The law school was opened two years ago in the basement of the main building where it remained during one year. During the last year it has occupied the new building erected for its accommodation. It has prospered from the day it was opened to the present time and there is no doubt that largely increased prosperity awaits it in the future. Fifty-seven students registered in this college the first year, and one hundred thirty-five in the second year. The accommodations of the school in its present quarters are ample. A library of respectable dimensions and of the most serviceable character has been provided, to which constant additions will be made. The Hon. William S. Pattee, Dean of the college, has devoted himself wholly to the interests of the college, and by his skill as a teacher, his wise administration, and his attractive personality, has contributed very largely to its success. Beside the very efficient corps of lecturers, all of whom have attended to their duties with great fidelity, Judge James O. Pierce, Selden Bacon, Esq., and Charles B. Elliott, Ph. D., have been employed as special instructors and have rendered most efficient service.

THE DEPARTMENT OF MEDICINE.

The department of medicine, embracing the three colleges of medicine and surgery, homeopathic medicine and surgery, and dentistry, has been conducted for two years in the hospital college building in Minneapolis, on the west side of the river. This building was originally leased to the board of regents of the University at a nominal rent for five years. The lease has already run more than two years. The building itself is not, either in its dimensions or its arrangement, all that the department needs, and the accomodations for all of the three colleges are in many respects inadequate. It has been necessary to rent another room for a chemical laboratory. A new building should be erected the coming year, on the University campus

with ample lecture rooms, laboratories and apparatus. The department will thus be brought into closer relations with the rest of the University and can more conveniently receive a larger degree of care and attention from the head of the University than its isolated situation at present permits. The demand for a first class medical education is strong, and there is no reason why that demand cannot be thoroughly met by the medical department of this University when provided with suitable equipments. But until it is thus provided the department will labor under serious difficulties and will do its work at great disadvantage. Application should be made by the board of regents to the next legislature for an appropriation that will supply this very urgent want of a new building and proper equipment.

Notwithstanding the difficulties under which the department has labored the past two years, a very creditable degree of success has attended its work. One hundred twenty-five students have been in attendance each year. The gentlemen of the different faculties have worked together in harmony; no jealousy between different "schools" of medicine has manifested itself; and the best has been done that could be with the means at hand. The faculty has been strengthened since the last report by the appointment of George A. Hendricks, M. S., M. D., of Ann Arbor, as professor of anatomy, and by the recent appointment of W. Xavier Sudduth, M. D., D. D. S,, of Philadelphia, as professor of oral surgery and pathology in the college of dentistry. Professor Hendricks has already more than justified his high reputation by his lectures during nearly the whole of two years' courses; and although Dr. Sudduth has but just entered upon his duties he has already inspired great confidence in the consequent progress of the college of dentistry. The course of instruction in the medical department, the last two years, has been for a period of six months each year. This course was found to be too short for the work required to be done; and accordingly the course has been extended to eight months in each year. The work in future will begin early in October, and will close with the other col leges of the University, the first Thursday of June. It is exceedingly gratifying that this change, though it materially affected the personal convenience of many of the professors, was unanimously approved and recommended by the faculty of the medical department. Its immediate effect will be probably to lessen somewhat the number of students. The University

can suffer no real loss from this, however, since students who choose an institution in which to study on account of the shortness of its course are not at all desirable. It would be better that professional students whose sole desire is to do as little as possible for a diploma, should do nothing and never attempt to secure a diploma; for in no department of learning is inferior attainment so dangerous as in medicine.

THE LIBRARY.

The weakest part of the University, considering its importance, is the library. With twenty-three thousand volumes nominally on the shelves, it may be doubted whether there are really ten thousand that are live and up to the time. The purchase of private libraries in the earlier days of the institution secured many books, some of which were good, but many of which were comparatively worthless. Many books of former times have become practically worthless by later investigations and discoveries. The importance of a library, containing the latest results of scientific investigation and of historical research, cannot be overrated nor over stated. It is the heart of the University. But it is hardly less important that the library should be accessible and capable of being comfortably used. It should be in a suitable building. Within its walls should be the laboratories of those departments which, like history, English literature, political science and psychology, require reference to many books even in the investigation of a single subject. The library building in the modern conception is not merely a store room for books to be handed out by one to the seeker after knowledge; it is, on the contrary, to literature and historical, political, and mental science what physical and chemical laboratories are to the sciences taught in them—at once the store-house of material and the laboratory in which the material is profitably used. The library of the University at present is stored in a suite of rooms, six in number, on the first floor of the main building, a building into whose construction no thought of making it fire-proof ever entered. These rooms were not themselves intended for the library. As books and pamphlets have multiplied, one after another of these rooms has been converted to library use, each more uninviting than any of its predecessors. If the board of regents has the slightest doubt that a library building is imperatively needed at once and that there is no feature of the University so unpleasant as the contracted quarters in which the books of the

institution are piled, a visit by the board to the sacred spot, and through the six rooms, all too crowded for any other than store-rooms, and only one of them furnishing the slightest accommodation for the searcher after truth who wishes to examine books to find out whether they contain what he seeks, wil remove the last lingering doubt on the subject and perfectly satisfy the board that a library building must be built at once.

It need not be a building for show. All that is wanted is a fire proof building with plenty of room for the books, and plenty of room for those who would use the books. A state institution should aim at utility rather than display in its buildings—and the officers and students of the university desire in the library building only security and room. The routine of daily teaching can go on with the library as it is—so it might go on if there were no library; but the modern library building with its store of live books, is what the University needs more than anything else, to lift it in its teaching, as well as its equipment, to the rank which its recent provision of buildings and equipment for scientific study has done so much to give it. It would be a noble act if some generous citizen should erect such a building for the University. But the state, for whose benefit the library is to exist, can richly afford to provide such a building as is needed; for its benefits will be conferred directly on thousands of her brightest sons and daughters and indirectly will be carried to every part of the commonwealth of Minnesota.

COLLEGE OF MECHANIC ARTS.

In the college of mechanic arts, Professor William A. Pike has ceased to be director and has been made dean of the faculty. Assistant Professor William R. Hoag has been elected professor of civil engineering and Assistant Professor John H. Barr has been elected professor of mechanical engineering. Mr. Albert I. Jones has been employed as instructor in metal working and Mr. Harry E. Smith, as instructor in mechanical engineering and wood-work. The removal of the department of physics to the new laboratory, and of the school of design to Pillsbury Hall, relieves the college of mechanic arts from unpleasant restriction in room, and gives it ample space for the prosecution of its work. The school of practical mechanics and the school of design attached to this college are well sustained and are worthy of the attention of persons desiring manual training. One hundred students have been connected with these schools the past year.

THE STUDY OF SCIENCES.

Two new buildings, the best on the campus, Pillsbury Hall and the physical and chemical laboratory, are devoted to the work of instruction in science. The equipment of these buildings for the purposes for which they are to be used, is believed to be equalled by the equipment for like purposes in few institutions in the country. Some idea of the amount of room and the value and variety of apparatus provided may be gained from the following statement of the provision made for the work in botany, animal biology, geology, physics and chemistry.

BOTANY.

Rooms. The department of botany occupies a suite of six rooms in Pillsbury Hall, viz: (1), a lecture room, 34 x 38 feet (2), a herbarium and seminar room, 33 x 18 feet; (3), a student's morphological laboratory, 33 x 52 feet; (4), a physiological laboratory, 33 x 18 feet; (5), a special laboratory and office 21 x 34 feet and a work room 21 x 34 feet, giving in all a floor space of 5,224 square feet.

Furniture.—The furnishing of the botanical rooms is antique oak throughout. The lecture-room contains seats for seventy students, each seat fitted with a writing-arm. The lecturer's desk is 18 x 3 feet, with drawers, cupboard, and pneumatic trough. Further, there is a table and sink for the disposition of living, illustrative material not in immediate use before the class. A chart-rack, 12 x 4½ feet, and a blackboard 18 x 8 feet complete the list of furniture.

The herbarium room contains bookshelves, tables, and separable plant-cases modeled somewhat after those in the British Museum.

The morphological laboratory is furnished with three truncated, slate-top, iron-based microscope-tables, each 10 x 7 x 8 feet, (7 is the window-end measurement, 8, the inside end measurement,) each accommodating seven students. In addition there is a slate-top chemical desk 24 x 4 feet, accommodating twenty-four students and two apparatus cases.

The physiological laboratory contains slate, truncated, and wall microscope tables, evaporating board, apparatus cases and moveable tables.

The special laboratory contains three slate-top wall-tables, book-shelves, apparatus cases, desk, library table and card catalogues.

The work room contains shelving, drying tables, vault, pigeon-hole cases and sink.

All the rooms are furnished with gas and water.

Outfit.—The herbarium contains the following collections of plants:

The Sandberg collection of Phanerogams, numbering	8,000
The Sandberg collection of Ferns and Hepaticæ	250
Underwood's Hepaticæ Americanæ	40
Ellis & Ernhardt's North American Fungi	2,500
Willey's North American Lichens	290
Five other collections not yet distributed	12,400
Total	23,480

The department of botany subscribes for eleven English periodicals, eleven French, two Italian, and twelve German.

The lecture room contains sets of botanical and physiological charts.

The general laboratories are filled with a full stock of best imported glassware, 20 Leitz compound microscopes giving 50 to 600 diameters, 17 Beck microscopes giving from 70 to 480 diameters, 4 Bausch & Lomb microscopes giving from 50 to 600 diameters and 5 Leitz dissecting microscopes. Wall-lockers are provided for the use of students.

The physiological laboratory contains glassware, klinostat, anxanometer, therno-electric apparatus, microtomes, centrifugal wheels, induction-coils, batteries, mercury baths, heliostat and other physiological apparatus. A Climax water motor is attached to the sink.

The special laboratory contains a set of Koch's largest and latest pattern bacterioscopic apparatus, a Becker's balance, a large hand Leitz microscope giving from 25 to 2,400 diameters magnification, accessory apparatus, staining materials, etc.

A plant house has been built adjoining the engine house. In it material is grown for the following objects:

(*a*) The dissection work in the courses on anatomy and general morphology; (*b*) the special work on the lower aquatic plants and the ferns; (*c*) the experimental work in physiology; (*d*) the illustration of the Minnesota Phanerogamic flora by type-species from each family.

ANIMAL BIOLOGY.

The rooms devoted to this department are nine in number, seven of them being on the upper floor of Pillsbury Hall, and

two in the basement. Those on the upper floor are a lecture room containing 1,085 square feet, a preparation room 240 square feet, an apparatus room 189 square feet, photographic room 152 square feet, a general laboratory 2,070 square feet, laboratory library 80 square feet, and professor's office 120 square feet. In the basement are the store room and work shop, and the aquarium room together containing 550 square feet.

The general laboratory for animal biology contains: Thirty (30) Zeiss' microscopes, each provided with a nose piece, a condensor, Zeiss' new iris diaphragm etc.; twenty-one (21) dissecting microscopes; twenty (20) well microtomes, one large Yung-Thoma and two Minot microtomes; forty (40) complete dissecting sets of scissors, scalpels, forceps, etc.; imbedding baths and accessories; reagents and staining fluids; the full set of Dr. Ziegler's wax models; the papier mache models of Dr. Auzoux; a good collection of skeletons from Prof. Ward, and from V. Fric, Prague, Bohemia; a large collection of marine animals from the zoological station at Naples, and many other valuable preparations. The laboratory also has twelve (12) tables fully equipped with reagents and apparatus for animal chemistry; revolving drums with clock work; an improved Du Bois Reymond spring myograph; induction coils, moist chambers, a good collection of apparatus for demonstrations and experiments in physiological optics; apparatuses for counting blood corpuscles; Thompson's astatic galvanometer and various other pieces of apparatus used in physiological research and demonstrations. The photographic rooms are equipped with a heliostat, a Zeiss' large photo-micrographic apparatus and everything necessary for making photographs of both large and microscopic objects.

The department of animal biology also has one of Zeiss' large stands with a full set of objectives, including an apochromatic set, and nearly all of Zeiss' accessories, such as: binocular eye piece, micro-spectroscope, illuminating apparatus for monochromatic light, camera lucidas, etc.

Without particularizing further, it can be said that for general laboratory work in what is popularly called zoology and physiology the equipment of the department of animal biology is second to none in the counry.

GEOLOGY AND MINERALOGY.

The rooms occupied by this departwent are on the first floor and in the basement of Pillsbury hall, directly under the rooms

devoted to botany and animal biology. There are large and well lighted laboratories beside recitation and lecture rooms and the office of the professor. The rooms are seven in number, containing 6,010 square feet. No mention is here intended to be made of the large amount of material accumulated by the department of geology in former years, or to be found in the museum. The changes and development of the last two years only are referred to.

Drawer cabinets have been provided in which to keep the study collections from the dust, and at the same time being in the laboratories, they are at all times accessible to the students.

The material composing these study collections has been largely increased by the addition of several hundred specimens of minerals and rocks and fossils, among which may be mentioned:

(*a.*) A fine set of crystals, representing the six crystal systems.
(*b.*) A series of minerals in the sulphide group.
(*c.*) A large quantity of minerals by the pound for blowpipe and other determinative work.
(*d.*) A series of carboniferous fossils from Iowa.
(*e.*) Collections in the state, and particularly around Minneapolis and St. Paul, have been made.

The beginning of a study collection of minerals has been made that the students in mineralogy may have a constant and ready reference in the laboratory.

A fine series of palæontologic charts, for illustrating the second term in geology, has been purchased.

Four lithologic microscopes, a fine stauroscope and an improved goniometer have also been purchased.

The two museums, each containing 4,000 square feet of space, the ample rooms of the geological survey, the room of the school of design, and the laboratory and assaying room of the school of mines, are all in Pillsbury hall. When these are added to the rooms already enumerated and described, the magnitude and value of the building can be readily appreciated.

CHEMISTRY.

The department of chemistry occupies the west half of the new physical and chemical laboratory. The chemical department has twenty-one rooms devoted to its use. Of these the

most important are the lecture room, the qualitative analytical laboratory, and the quantitative analytical laboratory. The lecture room, on the second floor, dimensions 30 ft. by 40 ft., seats about one hundred persons. It is intended to be used for lectures on general chemistry, with experiments, for which the customary arrangements have been provided. It will also be used as a recitation room for large classes. The qualitative analytical laboratory, on the second floor, dimensions 34½ by 52 ft., has work tables for the accommodation of forty students. Water, gas and other facilities are arranged for convenient use. This room, as the name implies, is designed for practice in qualitative analysis. It will also, at different hours of the day, be used for instruction in certain parts of general chemistry. Immediately connected with this room, and to be used in the same work, are three small rooms, each about 11 by 15 ft., namely, a spectroscope room, a microscope room and a room for keeping glassware and other apparatus. Considering the partitions as removed, the qualitative analytical laboratory is 34½ by 68 ft., extending across the whole west end of the building. The quantitative analytical laboratory, on the first floor, 34½ by 42½ ft., contains work tables for thirty-two students. It is intended for chemical work of the upper classes, who have already pursued the courses in general chemistry and qualitative analysis. Immediately connected with this room are a balance room, 16 by 24½ ft., and apparatus room, 17½ by 24½ ft. Including these the quantitative analytical laboratory is 34½ by 68 ft., extending across the whole west end of the building, under the qualitative laboratory.

On the first floor is a recitation room, 24½x27½ feet, for classes of moderate size. It is also fitted with arrangements for lectures with demonstrations. Other rooms on the first floor are: a room for water analysis, 15x30 feet, a private laboratory for the professor, 18x24½ feet, and a private laboratory for the assistant professor, 12½x30 feet.

Rooms additional to those mentioned on the second floor are: a preparation room, 13½x24½, near the lecture room and intended for keeping the apparatus used in lectures and for preparing the experiments for the day, and a room for the technological museum, 24½x28 feet, furnished with large cases of shelves and drawers.

Passing to the basement, the department has two rooms opening into each other, each 17x29 feet, for an organic analytical laboratory, a room 17x24 feet, for gas analysis, and a

balance room, 16x24 feet. These four rooms occupy the whole west end of the building, directly under the quantitative laboratory already mentioned. In addition there are in the basement a room for assaying and other furnace work, 24x27 feet, a storeroom for chemicals, 17½x24 feet, and a storeroom for glassware, 12x29 feet.

The work of chemistry has for years been well done and the equipment even in the old laboratory, previous to the fire, was fairly good. Some additions in the way of apparatus for special purposes have been made the last year, of which the following are the most notable:

Three analytical balances, with sets of weights; three microscopes, and a large spectroscope, Bunsen's model, for use in analysis; a Scheibler's saccharimeter; a photometer, and other apparatus for tests and analysis of gas; a gas furnace and accessories for organic analysis; a set of apparatus for the projection of spectra, and similar lecture-room experiments; a number of technological wall charts; several gas generators; an ice machine, using ammonia; a number of steam water baths; a steam distilling apparatus; three furnaces for crucibles and similar work. Besides the foregoing, a large number—about twenty-four hundred—of reagent bottles, a corresponding supply of glass and other ware of various kinds for regular and constant use in the laboratory, and a large stock of chemicals have been purchased, provision being thus made for fitting up nearly eighty students' work tables, more than double the number of tables that have previously been furnished.

PHYSICS.

The department of physics in the east half of the physical and chemical laboratory, has seventeen rooms, as follows: In the basement; (1.) Precision room, 948 square feet, solid masonry pillars for support of sensitive instruments. (2.) Pendulum room, 567 square feet, masonry pillars. (3.) cathetometer room, 567 square feet, masonry pillars. (4.) engine, dynamo and motor room, 839 square feet, masonry beds for engine and machines; Westinghouse 10 horse power engine. (5.) Workshop, 282 square feet, carpenter and vice benches, lathe, etc. (6.) Battery and accumulator, 480 square feet. On the first floor, (7.) General physical laboratory, 1,190 square feet. (8.) Apparatus room, 1, 590 square feet. (9.) General lecture Hall, 1,316 square feet, amphitheatre seats, lecture desk, etc. (10.) Coat room, 256 square feet. (11.) Recitation room, 816

square feet. On the second floor, (12.) Electrical laboratory, 1,200 square feet. (13.) Photometer room, 398 square feet. (14.) Professor's study and private laboratory, 495 square feet. (15.) Assistant's study and private laboratory, 432 square feet. (16.) Magnetometer room, 360 square feet. (17.) Library, reading and drawing room.

All rooms in this department are wired for electric light, for time, experimental current and call bells. Gas, water and sink in every room. In the attic are a meteorological room and a photograph room, provided with exposed window, skylight, &c. The whole available space for the department, exclusive of halls and stairways, is 12,712 square feet.

The department of physics possesses a large and valuable collection of instruments for lecture room purposes and practical laboratory work. Among the important pieces of apparatus are, a Societe Genevoise cathetometer, a Bianchi dividing engine, a spherometer, Atwood's machine, apparatus for illustrating all of the laws of elementary mechanics, hydraulic Press, U. S. signal service barometer, a complete set of thermometers, Breguet metallic thermometer, complete sets of hygrometers and hydrometers, three good chemical balances, one reversion pendulum, rotating table and attachments, three normal tuning forks, complete Lissajou's apparatus, Helmholz resonance globes, Chladni's plates, compound pendulum, manometric flame apparatus with mirror, sonometer, two heliostats, Browning spectroscope, Fresnel's mirrors and prisms, one Zeiss compound microscope, Duboscq optical bench and attachments, one W. and Q. spectrometer, diffraction grating, lantern polariscope, two students' polariscopes, an assortment of lenses and prisms, projecting lantern with Browning electric lamps, one Bunsen photometer, Goniometer, Holtz, Toepler-Holtz and frictional electric machines, storage batteries, Thompson's quadrant electrometer, spark micrometer, electric condensers, a variety of direct reading and reflecting galvanometers, two magnetometers, two induction coils, large and small, a collection of magnets of various forms, Verdi's chronograph, the complete set of meteorological instruments as furnished by the U. S. weather service, and the requisite glassware and mirror instruments to render the above a very complete physical equipment.

In addition to the apparatus of the physical laboratory, the electrical engineering department possesses Westinghouse 10 horse power engine, Edison 150 light dynamo, sets of lamps

and sockets, eight tangent galvanometers, two differential galvanometers, eight potential galvanometers, three Torsion galvanometers, two dynamometers, eight S. and H. resistance boxes, three normal ohms, two box bridges, six wire bridges, Thompson's reflecting galvanometers, three astatic galvanoscopes, sixty Daniell cells, twelve Bunsen cells, ten storage cells, four ammeters, four voltmeters, one Kruss incandescent lamp photometer, twelve reading telescopes and scales, magnetometer, one water voltameter, one copper voltometer, two silver voltometers. These instruments with the accessories make the University of Minnesota as well equipped for electrical work as the Royal Polytechnic school of Berlin, or the Swiss Polytechnic of Zurich. (Alternating current machinery has been excluded as being dangerous for any but advanced and experienced students.)

MILITARY DEPARTMENT.

The military department has been in operation two years, under the efficient management of Lt. Edwin F. Glenn, of the United States army. Drill and the study of military science now constitute a part of the curriculum for Freshman year. A good degree of proficiency has been attained by the girls as well as by the boys. It has been the policy of the faculty to excuse from the drill all girls who do not wish to take the drill. This policy is wise and should be continued. The military drill would be a legitimate part of the training in the school of agriculture, and should be introduced there as soon as circumstances will permit. The only obstacle at present to its introduction is the want of a drill hall. As the school is in session only during the cold weather, military exercises are impossible without a drill hall. The matter is commended to the attention of the regents for action at such time as the other more pressing needs of the University will permit.

GYMNASIUM.

There is no gymnasium connected with the University and the want of one is very much felt by the students, particularly in that part of the year when out-of-door exercise is almost impossible. It is not desirable that a gynasium should be provided solely or mainly in the interest of athletic sports, nor that these sports should become a leading feature of the University. But for the sake of the health of the students a gymnasium is desirable. A plain structure with the necessary apparatus and instruction in the use of it, will meet every re-

quirement. It is not expected that all the needs of the University will be met at once, especially in this, its building era. But attention is called to this want, simply because it is a real want, in order that it may be considered by the board in connection with the other needs of the institution and may receive such attention as its relative importance may justify.

NUMBER OF STUDENTS AND CONSEQUENT EXPENDITURES.

By vote of the board of regents the preparatory class was discontinued at the close of the year 1889–90, and no injurious results are likely to be experienced. The total number of students in the University in the year 1888-89 was seven hundred eighty-one; in the year 1889-90, one thousand two. The prospects for the coming year are such as to indicate a larger attendance even than during the past year. The expense of providing teachers for the large increase of students must be somewhat greater than heretofore, though the increase of expense will not by any means be in the same ratio as the increase in the number of students. It is very fortunate for the University that provision for the exigencies resulting from its rapid growth was made in good time, and that no serious difficulty need be apprehended no matter how many students may present themselves. Aside from the library and the medical department, the school of agriculture is the only part of the University that is likely in the near future to have more students than it can care for with its present buildings, and the erection of another building for this school as was contemplated when the last building was erected, would remove this difficulty. The present indications are that this new building will be needed the next year if not the present year.

CYRUS NORTHROP,
President.

DEGREES CONFERRED.

Since the last report degrees have been conferred as follows:

	1889.	1890.
Bachelors of Arts	7	10
Bachelors of Science	10	22
Bachelors of Literature	9	11
Bachelors of Civil Engineering	1	0
Bachelors of Mechanical Engineering	..	3
Bachelors of Laws	3	40
Doctors of Medicine	20	17
Doctors of Dental Surgery	1	6
Masters of Arts	1	..
Masters of Literature	..	1

The names and residences of these graduates are given in Appendix "A."

The enrollment and classification of students during the two years covered by this report, 1888-89 and 1889-90, are given in Appendix "B."

The following table shows the number and kinds of degrees which have been conferred by this University:

	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	Total.
B. A.	2	1	3	3	9	5	8	4	10	11	8	9	3	6	7	6	7	10	112
B. S.	....	1	2	5	3	8	10	9	10	9	7	9	3	6	12	12	10	22	138
B. L.	....	....	1	....	4	1	6	4	7	11	7	3	6	6	5	14	9	11	95
B. C. E.	....	....	3	3	....	....	2	....	....	....	2	3	2	....	1	1	1	9	27
B. M. E.	....	....	....	....	....	1	....	....	....	....	1	....	1	....	1	2	....	3	9
B. Arch.	....	....	....	....	1	....	....	....	....	....	....	....	....	1	....	....	....	....	2
B. Agric.	....	....	....	....	....	....	....	....	....	1	....	....	1	....	1	....	....	....	3
L. L. B.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	40	43
B. M.	....	....	....	....	....	....	....	....	....	....	....	2	2	3	2	....	....	....	9
M. D.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	20	17	37
D. D. S.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	6	7
M. A.	....	....	....	....	....	....	....	1	1	....	....	....	....	....	1	....	1	....	4
M. S.	....	....	....	....	....	....	....	....	....	1	....	....	1	....	....	1	....	....	3
M. L.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1
Ph. D.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1
C. E.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1
Totals.	2	2	9	11	17	15	26	18	28	33	25	26	19	22	30	38	52	119	492

The whole number of degrees conferred is 492, five persons having received degrees both in science and in engineering; one person having received a degree both in arts and in science, and seven bachelors having received a master's degree, after passing the required examinations. No honorary degrees have been conferred.

The whole number of degrees conferred on women is 108, viz: Bachelors of Arts, 17; of Science, 24; of Literature, 63; of Medicine, 1; Doctor of Medicine, 1; Master of Literature, 1; and Doctor of Dental Surgery, 1; one person having received a degree both in arts and science, and one person having received both a Bachelor's and a Master's degree in Literature: The number of women therefore who have received a degree is 106.

CYRUS NORTHROP,
President.

APPENDIX "A."

At the seventeenth annual commencement, held June 6, 1889, the following persons received degrees:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS.

FOR BACHELOR OF ARTS—7.

William Whittelsey Cheney.....Minneapolis
John Culbert Farles.....Minneapolis
Arthur E. Giddings.....Anoka
William Baker Ladue.....Salem, Oregon
Margaret Louisa Sewall.....St. Paul
Lydia Kathrina Strohmeier.....Minneapolis
Oscar Lovell Triggs.....Tuopi

FOR BACHELOR OF SCIENCE—10.

Frank Sherman Abernethy.....Minneapolis
Karle J. Babcock.....Minneapolis
Gratia Alta Countryman.....Minneapolis
John Paul Goode.....Marion
Frank Dumars Jones.....Minneapolis
Alfred Lind.....Winthrop
George Henry Meacham.....Prescott, Wis
Alonzo Draper Meeds.....Stillwater
Ada Emily Smith.....Algona, Iowa
Walter Lincoln Stockwell.....Anoka

FOR BACHELOR OF LITERATURE—9.

*Hendric Charles Babcock.....So. Brookfield, N. Y.
Rebecca Virginia Baker.....Minneapolis
Gustav O. Brohough.....Red Wing
Mattie Laura Elwell.....Minneapolis
Henry Johnson.....Sauk Center
Jessie McMillan.....Minneapolis
Robert Leslie Moffett.....Minneapolis
Maud Thompson.....Minneapolis
Helen Edith Waters.....Minneapolis

FOR MASTER OF ARTS—1.

William Aaron Hadley (B. A. '81, Earlham College.)

THE COLLEGE OF MECHANIC ARTS.

FOR BACHELOR OF CIVIL ENGINEERING—1.

Clarence Stanley Coe.....Iowa City, Ia

THE DEPARTMENT OF LAW.

FOR BACHELOR OF LAWS—3.

James Manahan.....Chatfield
Frank John Smith.....Minneapolis
Charles Sumner Whiting.....Rochester

*Fellows of the University of Minnesota" for the year 1889-90, by election of the University Fellowship Association.

THE DEPARTMENT OF MEDICINE.

FOR DOCTOR OF MEDICINE—20.

The College of Medicine and Surgery—16.

John Allen Bernard	Minneapolis
Ralph Rollin Chase	Minneapolis
Guy Philander Corwin	Minneapolis
Nils Gustaf Dahlstedt	Minneapolis
Charles Elvin Dutton	Minneapolis
Edward Anton Edholm	Minneapolis
William Henry Hanscom	Minneapolis
Knute Andrias Kjos	Minneapolis
Ole Edvard Linjer	Duluth
William Francis McCarthy	Minneapolis
George W. Phillips	St. Paul
Johan Andrew Regner	Minneapolis
John South, Jr.	Minneapolis
Edwin Darwin Steel	Mankato
Frank Adolphus Watkins	Minneapolis
Ulysses Grant Williams	Minneapolis

The College of Homeopathic Medicine and Surgery—4.

Wallace E. Belt	Minneapolis
Benedicta Lager Carlson	St. Peter
Fred Wilbur Urie	Minneapolis
Edward Weldon Young	Minneapolis

FOR DOCTOR OF DENTAL SURGERY—1.

Gainsford Ridgeway	Minneapolis

At the Eighteenth Annual Commencement, held June5, 1890. the following persons received degrees:

THE COLLEGE OF SCIENCE, LITERATURE AND THE ARTS.

FOR BACHELOR OF ARTS—10.

Hattie Louise Andrews,	Minneapolis
Christian H. Christianson,	Bath
Charles Thompson Conger,	78 Washington Place, N. Y.
Lana Mariah Countryman,	Minneapolis
Harrison Earl Fryberger,	Minneapolis
Lewis Henry Kennedy,	Litchfield
Gustave Axel Petri,	Minneapolis
*Joseph Brown Pike,	Minneapolis
Milton Rex,	Minneapolis
Frederick Cogswell Waite,	Winona

FOR BACHELOR OF SCIENCE—22.

Henry Patterson Bally,	Minneapolis
William Artemus Beach,	Minneapolis
Frank Joseph Brabec,	Hutchinson
Peter Christianson,	Bath
Henry Cotton,	Prescott, Wis.
Frank Edward Covell,	Minneapolis
Rollin Edward Cutts,	Forest City
Warren Maynard Dodge,	Farmington
James Colfax Grant,	Minneapolis
Otis Carsley Gross,	Pickwick
Charles William Jackson,	Brooklyn Centre
Harry Martin Kennedy,	Litchfield
Patrick Kennedy,	Oshawa

Burt Frank Lum,.....Minneapolis
Louise Montgomery,.....St. Cloud
Herbert Gilman Richardson.....Minneapolis
Oscar Kelsy Richardson,.....Minneapolis
Albert Woodward Shaw,.....Minneapolis
Edward Martin Spaulding,.....Minneapolis
Max West,.....Minneapolis
Ole Knute Wilson,.....Gilchrist
Walter Edwin Winslow,.....Minneapolis

FOR BACHELOR OF LITERATURE—11.

Antoinette Judson Abernethy.....Minneapolis
Victor Selden Clark.....Minneapolis
Sarah Catherine Comfort.....Minneapolis
Flora Joy Frost.....Jackson
Mary Mills.....Elk River
Jessie May Nicol.....Minneapolis
Edith Viola Phillips.....Minneapolis
William Henry A. Rutherford.....Rockford
Olof Scrumgard.....Minneapolis
Charles Lyesring Sommers.....St. Paul
Mary Louise Weber.....Ellington

FOR MASTER OF LITERATURE—1.

Matilda Jane Wilkin.....Minneapolis

THE COLLEGE OF MECHANIC ARTS.

FOR BACHELOR OF CIVIL ENGINEERING—.

John Lucius Burt.....Minneapolis
Wilbur Wainwright Dann.....Minneapolis
Fred Hayward Gilman.....Rosemount
Williston Wirt Greenwood.....Mankato
John Foot Hayden.....Fargo, N. D
John Turner Higgins.....Hutchinson
William Housmer Hoyt.....Minneapolis
William Carpenter Smith.....St. Cloud
Barney Elias Trask.....Minneapolis

FOR BACHELOR OF MECHANICAL ENGINEERING—3.

Martin Hughes Gerry, Jr.....Minneapolis
Theorwald Ed Nilson.....Atwater
Herbert M. Woodward.....Richfield

THE DEPARTMENT OF LAW.

FOR BACHELOR OF LAW—40.

Joseph Boyd Allen.....Minneapolis
Michael M. Anderson.....Hendrum
Bertrand A. Avery.....Albert Lea
Winfield W. Bardwell.....Minneapolis
John William Best.....St. Paul
Charles E. Bond.....Minneapolis
James Montgomery Burlingame, Jr.,.....Owatonna
Johnston Campbell.....Marine Mills
John William Conlow.....Minneapolis
Frank Thomas Corriston.....Minneapolis

* Fellows of the University of Minnesota" for the year 1889, by election of the University Fellowship Association. Mr. O. L. Trigge, Fellow of '89, is also continued for another year, but without stipend.

Daniel Lincoln Dawley.....Smithfield
Horace Danforth Dickinson.....Minneapolis
George Perkins Douglass.....Minneapolis
Simpson Ferree.....Minneapolis
John Thomas Getty.....Minneapolis
Edgerton Ferguson Gummer.....Frazee City
James Elsworth Gyde.....Minneapolis
Alfred James Harris.....Kent
Charles August Holt.....Minneapolis
John C. Judge.....Minneapolis
Robert S. Kolliner.....Stillwater
John Andrew Larimore.....Minneapolis
Ezra Edward McCrea.....Hamline
Henry Stowell Mead.....Minneapolis
Charles J. Monson.....Otisville
John Peter Nelson.....Minneapolis
Robert Boyd Nutting.....Northfield
James Paige.....Minneapolis
Ralph James Parker.....Spring Valley
Samuel Cleland Polley.....Aitkin
Charles Edward Purdy.....Minneapolis
John Rustgard.....Minneapolis
Charles Melancthon Schaeffer.....Minneapolis
Jacob Daniel Smeltzer.....Minneapolis
Albert J. Smith.....Minneapolis
Harry Davis Stocker.....Minneapolis
Charles Fielding Stone.....Howard Lake
William Robert Triggs.....Minneapolis
James Henry Waters.....Minneapolis
Edward Winterer.....Le Sueur

THE DEPARTMENT OF MEDICINE.

FOR DOCTOR OF MEDICINE—17.

The College of Medicine and Surgery—15.

Frank Wilson Dean.....Minneapolis
Rollo C. Dugan.....Eyota
Corydon Lovine Ford.....Ann Arbor, Mich
Frederick Erasmus Franchere.....Lake Crystal
Charles Lyman Greene.....St. Paul
John Louis Hennemuth.....St. Paul
Charles Henry Jones.....Minneapolis
John Lyng.....Minneapolis
Dennis Francis O'Connor.....Afton
Timothy O'Connor.....Annandale
Alfred Miller Ridgway.....Minneapolis
Abram Siemens.....Mountain Lake
Andrew Soderlind.....Minneapolis
Joab Stowell, Jr.....Minneapolis
Charles Osborne Wright.....Hastings

THE COLLEGE OF HOMEOPATHIC MEDICINE AND SURGERY—2.

Fred Augustus Carrell.....Plainview
Arthur Eugene White.....Minneapolis

FOR DOCTOR OF DENTAL SURGERY—6.

Clinton Smith Deitz.....Lake Preston, S. D.
William Herbert Dunn.....Northfield
Arthur Ellsworth Peck.....Minneapolis
Charles Alonzo Van Duzee.....St. Paul
Franklin Randolph Wright.....Minneapolis
Edith Hewett White.....Minneapolis

APPENDIX "B."

The following tables exhibit the enrollment and classification of the students:

SUMMARY 1888-89.

Department.	Class.	G'ntlemen.	Ladies	Total.
Graduate Students		20	14	34
College of Science, Literature and Arts, and College of Mechanic Arts	Senior	20	9	29
	Junior	51	12	63
	Sophomore	56	14	70
	Freshmen	94	31	125
	Sub-Freshmen	42	4	46
	Special	39	42	81
School of Practical Mechanics		72		72
School of Design, Free-hand Drawing and Wood Carving		16	27	43
School of Agriculture		47		47
Department of Law	Senior	4		4
	Junior	63		63
College of Medicine and Surgery	Senior	16		16
	Middle	25	1	26
	Junior	30	3	33
College of Homeopathic Medicine and Surgery	Senior	3	1	4
	Middle	5		5
	Junior	3	1	4
College of Dentistry	Senior	1		1
	Middle	7	1	8
	Junior	13	1	13
Special Medical Students		5	1	6
		631	162	709
Twice counted		10	2	12
Total		621	160	781

SUMMARY 1889-90.

Department.	Class.	G'ntlemen.	Ladies	Total.
Graduate Students		23	25	48
College of Science, Literature and Arts, and College of Mechanic Arts	Senior	47	10	57
	Junior	50	16	66
	Sophomore	62	26	88
	Freshman	105	53	158
	Sub-Freshman	33	13	46
	Special	48	53	101
School of Practical Mechanics		62	.....	62
School of Design, Free-hand Drawing and Wood Carving		13	25	38
School of Agriculture		78	.....	78
Department of Law	Senior	45	.....	45
	Junior	88	1	89
College of Medicine and Surgery	Senior	18	.....	18
	Junior	27	5	32
	Freshman	35	2	37
College of Homeopathic Medicine and Surgery	Senior	3	.....	3
	Junior	2	.....	2
	Freshman	3	.....	3
College of Dentistry	Senior	5	1	6
	Junior	9	1	10
	Freshman	12	.....	12
Special Medical Students		3	1	4
Department of Veterinary Medicine	Junior	4	.....	4
		775	232	1,007
Twice counted		5	.....	5
Total		770	232	1,002